Peptide hydrogels are biomolecular materials of potential utility in tissue engineering, drug delivery and cell culture. While most reported peptide gels have been based on β-sheet peptides, we recently reported a pH-responsive gel based on a designed α-helical peptide. The 21-residue peptide AFD19 assembles into discrete coiled coils at low pH (Figure 1, step a). At pH ≥4, the coiled coils rearrange into extended helical fibrils (step b), while at pH 6, the fibrils undergo non-covalent cross-linking to form a self-supporting gel (step c). Gelation occurs at a peptide molecular charge of close to +1, and appears to involve a balance between fibril solubility and hydrophobic association of fibrils. Building on this molecular insight, we were able to alter the sequence of AFD19 to obtain a redesigned peptide that gels at pH 7.4, suitable for mammalian cell culture.

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Dr Dexter completed undergraduate studies in Biochemistry at the University of Queensland. She earned her MS and PhD at the University of Illinois at Urbana-Champaign, where she was awarded a University of Illinois Fellowship and a Howard Hughes Medical Institute Predoctoral Fellowship. She carried out postdoctoral work at the Massachusetts Institute of Technology, and returned to the University of Queensland in 2004. She is currently an ARC Future Fellow and Associate Group Leader in the Australian Institute for Bioengineering and Nanotechnology.
Lipopolysaccharide (LPS) is a glycolipid found exclusively in the outer leaflet of the asymmetric outer membrane of Gram-negative bacteria. Proper placement of LPS at this location is critical for the outer membrane to function as an effective permeability barrier against toxic compounds, as well as for cell viability; thus inhibitors of this pathway could represent useful antibiotics. In *Escherichia coli*, two essential proteins LptD and LptE are responsible for establishing the lipid asymmetry of the outer membrane. In this seminar, I will talk about our work in characterizing the function and assembly of the two-protein LptD/E complex, and discuss the possible mechanism by which LPS is inserted into the outer leaflet of the outer membrane.

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I received my B.Sc.(Hons) in Chemistry from the National University of Singapore and my Ph.D. in Chemistry from Harvard University. During my Ph.D. in the laboratory of Prof. Daniel Kahne, I characterized the seven-protein complex that are responsible for lipopolysaccharide export and studied the mechanism of lipopolysaccharide assembly at the cell surface of Gram-negative bacteria. After a short postdoctoral stint at the Harvard Medical School, I began as an Assistant Professor at the National University of Singapore. My research group is interested in understanding outer membrane assembly, specifically in elucidating the mechanisms for lipid trafficking in Gram-negative bacteria and mycobacteria.
Biotechnology is an emerging area of scientific and technological opportunity, which requires multi-disciplinary efforts ranging from basic sciences to engineering and technological development. A major theme of biotechnology includes development of micro/nanoscale tools for studying biosystems and smart systems for the treatment of important diseases. Specific research fields include developing platforms to assay biological and biochemical events—enzymatic activity assays and biomolecular interactions—for diagnostic tools and/or drug screening. In another approach, nanoparticles are actively harnessed for biosensors, cancer imaging, and targeted drug delivery in the same realm. The talk will cover development of chemically well-defined novel micro/nano-systems and approaches designed specifically for the treatment of viral diseases.

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Dal-Hee Min received her master’s degree from Seoul National University in 1999, and her Ph D. from University of Chicago in 2005. She joined Prof. Sangeeta Bhatia’s group as a postdoctoral researcher in Division of Health Science and Technology, MIT. In Oct. 2007, she moved to KAIST as an Assistant Professor of the Department of Chemistry and then, continued her research as an Associate Professor at Seoul National University from Sept 2011. Her recent research projects especially focus on development of bioanalytical platforms based on various nanomaterials for diagnostics, biosensing and drug development with collective understanding on nano-surface chemistry.